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Improving Targets for the Prevention of Drug Use Disorders: Sociodemographic Predictors of Transitions Across Drug Use Stages in the National Comorbidity Survey Replication

Joel Swendsen, Ph.D.¹, James C. Anthony, Ph.D.², Kevin P. Conway, Ph.D.³, Louisa Degenhardt, Ph.D.⁴, Lisa Dierker, Ph.D.⁵, Meyer Glantz, Ph.D.³, Jianping He, M.S.⁶, Amanda Kalaydjian, Ph.D.⁶, Ronald C. Kessler, Ph.D.⁷, Nancy Sampson, B.A.⁷, and Kathleen R. Merikangas, Ph.D.⁶

¹ National Scientific Research Center (CNRS 5231), Bordeaux, France

² Department of Epidemiology, Michigan State University, Lansing, Michigan, USA

³ Division of Epidemiology, Services, and Prevention Research, National Institute on Drug Abuse, National Institutes of Health, USA

⁴ National Drug and Alcohol Research Centre, University of NSW, Sydney, Australia

⁵ Wesleyan University, Department of Psychology, Middletown, Connecticut, USA

⁶ Intramural Research Program of the National Institutes of Health, National Institute of Mental Health, Bethesda, Maryland, USA

⁷ Department of Health Policy, Harvard University, Boston, Massachusetts, USA

Abstract

Objectives—Models of drug use etiology and prevention require precise information concerning the expression of population-based risk factors across the continuum of drug use. However, the majority of previous epidemiologic research on this topic has not addressed transitions between specific drug stages. The present investigation examined the sociodemographic predictors of progression across six stages of drug use in the National Comorbidity Survey Replication (NCS-R), a nationally representative household survey of the U.S. population conducted between February, 2001 and April, 2003.

Methods—Lifetime history of opportunity to use illicit substances, initial drug use, and DSM-IV drug use disorders were collected using in-person structured diagnostic interviews.

Results—The median age of first opportunity to use drugs as well as drug use, abuse and dependence each occurred prior to age 20, while the median remission from abuse and dependence occurred at 26 and 30 years, respectively. Most sociodemographic variables, in particular sex and ethnicity, demonstrated highly differential associations with transitions depending on the stage examined.

Correspondence should be addressed to: Joel Swendsen, Ph.D., National Scientific Research Center (CNRS 5231), University of Bordeaux, 146 rue Léo Saignat, 33076 Bordeaux, France, Telephone: 011(33)557571964, Fax: 011(33)557571976, Joel.Swendsen@u-bordeaux2.fr.

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Conclusions—The findings may partially explain the effectiveness of strategies designed to reduce drug use, abuse and dependence, and indicate that increased correspondence is needed between available epidemiologic data and existing models of etiology or prevention.

Keywords

Prevention; Substance-Related Disorders; Epidemiology; Demographic Factors

INTRODUCTION

Numerous drug prevention programs in the United States incorporate strategies to address psychosocial or demographic risk factors (Winters et al., 2007) based on findings from community samples of adolescents (Degenhardt et al., 2000; Konings et al., 1995; Lynskey et al., 1999; Melchior et al., 2007; Perkonig, Pfister et al., 2006; von Sydow et al., 2002; Wallace et al., 2003) and adults (Anthony et al., 1994; Compton et al., 2007; Johnson & Gerstein, 1998; Kerr et al., 2007; Kessler et al., 2005; Medina-Mora et al., 2005; Oakley Browne et al., 2006; Warner et al., 1995). The age at which initial stages are reached is also strongly associated with abuse and dependence (Anthony, & Petronis, 1995; Chen et al., 2005; Grant & Dawson, 1998; McCabe et al., 2007) and has provided additional information for both selective and indicated prevention programs.

Although progress has been made particularly in reducing incident cases of disorder onset among drug users (see Cuijpers, 2003; Hawkins et al., 1992; Toumbourou et al., 2007), greater advances may be achieved by decomposing previously documented aggregate associations in an effort to pinpoint the precise transitions across the drug use trajectory that are most associated with specific risk factors. The few published epidemiologic studies on this topic confirm the significant role of certain sociodemographic characteristics (Anthony et al., 1994; Chen et al., 2005; Grant & Dawson, 1998; Wagner & Anthony, 2007; Stone et al., 2007), but also that other risk factors, including gender and ethnicity, may have markedly different effects depending on stage of use (Grant & Dawson, 1998; O'Brien & Anthony, 2005; Van Etten et al., 1999).

Detailed descriptive information concerning how sociodemographic risk factors vary across the full trajectory of drug use is therefore needed to adjust risk formulas and potentially improve the precision of prevention strategies. Using data from the National Comorbidity Survey Replication, the present investigation examines this question across six stages of drug involvement.

METHODS

NCS-R Sampling and Field Procedures

The NCS-R is a nationally representative face-to-face household survey of the prevalence and correlates of a wide range of DSM-IV mental disorders carried out between February, 2001 and April, 2003 (for details see Kessler, Berglund et al., 2004; Kessler & Merikangas, 2004). The sampling frame was English speaking adults selected using a multi-stage clustered area probability design from the civilian household population of the continental United States. The NCS-R procedures were approved by the human subjects committees of Harvard Medical School and the University of Michigan.

The NCS-R interview was carried out in two parts. The Part I interview was administered to a nationally representative household sample of 9282 respondents ages 18 and older. The response rate was 70.9% and informed consent was obtained from all participants. Part I included the core mental disorders assessed in the survey along with a battery of

sociodemographic variables. Part II was administered to 5692 of the 9282 Part I respondents, including all Part I respondents with a lifetime core disorder plus a probability subsample of other respondents. The Part II sample was weighted to adjust for differential probabilities of within-household selection, differential probabilities of selection from the Part I sample into the Part II sample based on Part I responses, and for discrepancies between the sample and the US population on sociodemographic and geographic factors assessed in the 2000 Census.

Diagnostic Assessment and Drug Use Stages

The opportunity to use drugs, drug use, and DSM-IV diagnoses of abuse and dependence were assessed using version 3.0 of the World Health Organization Composite International Diagnostic Interview (CIDI; Kessler & Ustun, 2004). Good concordance was found between CIDI and SCID diagnoses for substance use disorders and for a wide range of anxiety, mood, and externalizing disorders assessed in the survey (Haro et al., 2006). The drug module of the CIDI was administered to the entire Part II sample. An initial screening question asked respondents if they ever used marijuana or hashish, cocaine in any form, prescription drugs either without the recommendation of a health professional or for any reason other than what a health professional said they should be used for, or other illicit drug. If the respondent endorsed use of any of these drugs, the interviewer then asked questions concerning age of first use, frequency of use, and presence of DSM-IV criteria for drug abuse (a repetitive pattern of drug use causing legal or interpersonal problems, increasing physical danger, or preventing fulfillment of major role obligations). Respondents were also asked about the frequency of such problems, the age of the respondent when he or she had the problem for the first and last time, and the number of years they had the problem. If respondents endorsed any problems related to drugs, they were also asked questions about DSM-IV drug dependence (symptoms of physical tolerance, withdrawal, uncontrolled drug use or inability to stop use, excessive time invested in order to acquire drugs, reduction in regular activities due to drugs, and continued drug use despite harmful or undesirable consequences), as well as age of first onset of symptoms and timing of most recent symptoms. All respondents were asked their age the first time they had the opportunity to use any illicit drug (regardless of type), defined as either being offered a drug or being present while others were using a drug and being able to use it if desired. Past users who no longer used drugs at the time of interview were asked their age of most recent use. Age of remission from drug abuse or dependence was defined as the age two years after the respondent most recently used drugs. An age-of-onset variable was examined for each of the six stages of drug use, and variables were created to represent the duration of transitions between each drug use stage.

Sociodemographic and drug classification variables

Sociodemographic variables include birth year cohort: 1972–1983, 1957–1971, 1942–1956, and 1941 or before; sex; race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, and Other); completed years of education [less than high school (0–11), high school (12), some college (13–15), and college graduate (16 or more)], student status (student vs. non-student); and marital status (never married, previously married, and currently married/cohabitating). Information collected for education, student status, and marital status was used to treat these variables as time-varying covariates in survival analyses. Drug classification variables included number of drugs and drug type.

Statistical Analyses

Estimated projections of the cumulative probability of drug use stages as of age 60 were obtained by the actuarial method implemented in PROC LIFETEST in SAS (version 9.1.3, SAS Institute, Cary, N.C.). The actuarial method is similar to the more familiar Kaplan-Meier method but handles ties in a more intuitive fashion. The associations between timing and speed

of transitions between drug use stages were estimated in discrete-time multivariable logistic regression analyses with person-year as the unit of analysis (Efron, 1988). Standard errors and significance tests were estimated using the Taylor series linearization method (Wolter, 1985) implemented in SUDAAN to adjust for design effects (Research Triangle Institute, 2004). The person-year variable was defined as the number of years since onset of the earlier drug use category up to either age of onset of a later drug use stage or age at interview (for censored cases). Each data array began with year 0 (i.e., the same year as the earlier transition) to allow for the fact that respondents could make multiple transitions in the same year (e.g., start use and become an abuser in the same year as they first had an opportunity to use). Individuals who progress from one stage to the next within the same year were treated as having made two transitions in the same year. When predicting remission from drug abuse or dependence, the person-year variable was defined as the number of years since the onset of drug abuse or dependence, respectively, up to either age of remission of abuse or dependence or age at interview (for censored cases). Discrete-time survival models included sociodemographic variables, number of drugs and drug type as predictors of a given drug-related outcome, and assessed the influence of age of onset of each previous stage as well as speed of transition between stage categories. Due to existence of linear combinations among these predictors, it was not possible to simultaneously test for their effects within the same model. We therefore ran multiple preliminary models with different combinations of age of onset and speed of transition variables, and then selected the variables that were most consistently associated with the outcome for use in the final models.

RESULTS

Prevalence and Age of Onset of Drug Use Stages

Table 1 presents the lifetime prevalence of drug use stages in the Part II sample (n=5692). The prevalence of drug use, abuse and dependence, as well as remission from abuse and dependence, was generally highest among individuals born between 1957 and 1971. Concerning conditional prevalence rates, this cohort was also the most likely to have used drugs if given the opportunity. Individuals in the oldest cohort were the least likely to use drugs if they had the opportunity, or to abuse drugs if they were drug users, but a greater portion of these individuals developed dependence if they abused drugs.

Age-of-onset distributions of Transitions among Drug Use Stages

Figure 1 illustrates that the median age of first opportunity was 16 years and the median onset for the subsequent stages of use, abuse and dependence each occurred prior to age 20. The median age of remission was 26 for respondents with abuse, and 30 for those with dependence. As illustrated in Figure 2, the median delay between first opportunity and any illicit drug use was one year. Half of drug users continued to use illicit substances for three years before abuse occurred, but the speed of transition from abuse to dependence took less than one year. Drug abuse persisted for five years until remission occurred, while dependence persisted for seven years.

Sociodemographic predictors of Transitions among Drug Use Stages

The results of the discrete-time logistic regression analyses for opportunity to use and transitions to drug use, abuse or dependence are presented in Table 2. Despite the important association of birth cohort with the early stages of opportunity and use of drugs, no significant associations were observed by cohort in the transition from use to abuse, or from abuse to dependence. Women were less likely to have the opportunity to use drugs or to make the transition to using or abusing drugs, but women meeting criteria for drug abuse were more likely to become dependent. 'Other' minority races were less likely than Whites to have the opportunity to use drugs, but these same individuals were more than twice as likely to make

the transition from drug use to abuse. Hispanics and Blacks were less likely than Whites to use drugs when given the opportunity. Compared to individuals with the highest education, all other education levels had a probability three times greater of having the opportunity to use drugs. Although significant odds ratios were also observed for lower education levels in the transition from drug use to abuse, only current student status was associated with greater probability of using drugs when given the opportunity. Concerning marital status, never-married respondents were more likely to have the opportunity to use drugs, as well as to continue on to drug use and abuse stages. Those who were formerly married were more likely to use drugs when given the opportunity, and more likely to transition from use to abuse. An earlier age of first drug use and a shorter time between opportunity to use and first drug use were both associated with an increased probability of developing abuse. In comparison to cannabis, the likelihood of transitioning to drug abuse was increased for cocaine, extra-medical drugs or other illicit drugs. In turn, cocaine and other illicit drugs also increased the probability of transition from abuse to dependence.

Whereas the three younger cohorts were generally more likely to remit from drug abuse or dependence (Table 3), this effect was particularly salient for individuals born between 1972 and 1983. Women were also more likely than men to achieve remission from both disorders. However, the likelihood of remission from either drug abuse or dependence was unrelated to race-ethnicity, marital status, or education. An older age of drug abuse was associated with increased probability of remission from this disorder. Finally, in comparison with cannabis, the use of cocaine and extra-medical drugs were associated with a decreased probability of remission from drug abuse. No specific drug type was associated with remission from drug dependence.

DISCUSSION

The most common sociodemographic risk factors identified through aggregate analyses in epidemiologic investigations were used to predict *transitions* across specific stages of drug use. Birth cohort was significantly associated with transitions to having the opportunity to use drugs, to initial drug use, and to remission from drug use disorders. However, it was not associated with the risk of abuse among drug users, or with dependence among drug abusers. The effects of education and marital status were linked primarily to transitions among the first three stages. By contrast, transitions to abuse, dependence or remission were significantly associated with drug type or history of drug use.

Additional important findings concern the manner in which some variables exerted qualitatively different effects depending on stage of use. In particular, female drug abusers were significantly more likely than males to progress from drug abuse to dependence. This finding is opposite to investigations reporting a reduced risk of drug dependence among women when estimating such risk relative to the overall population (Compton et al., 2007; Oakley Browne et al., 2006; Warner et al., 1995; Chamberlain et al., 2004; Farrell et al., 2001). Although it is similar to other studies of drug stage transitions (Anthony et al., 1994; O'Brien, & Anthony, 2005), it suggests that the increased risk for women may involve only the transition from abuse to dependence. Women were also more likely to make the transition to remission, a finding consistent recent evidence that drug-dependent men in treatment oscillate more frequently between drug use and abstinence (Gallop et al., 2007). Whereas 'other' minority groups were less likely than Whites to have the opportunity to use drugs, they were more likely to transition to abuse. Most epidemiologic investigations have demonstrated lower drug use disorders among ethnic minorities, with the notable exception of Native Americans (Wallace et al., 2003; Compton et al., 2007). The present findings argue for the need to increase resources to reduce the risk of progression after the initial stages of drug involvement in these populations.

Study Limitations and Strengths

The present findings should be interpreted in light of the small subgroups for specific variables and relative to the statistical methods or software applied. Alternative analytic strategies might include longitudinal latent growth mixture models or multivariate latent transition models, and researchers may wish to explore if more optimal results can be achieved by instantaneous risk estimates. The retrospective assessment of drug use history in the NCS-R may also increase the risk of “forward telescoping” (e.g. Johnson & Schultz, 2005), while the prevalence of drug use in older cohorts may be biased downward due to greater stigmatization of drug use, greater time since events, changes in perception of one’s drug use, or because of mortality risks that have had more time to accumulate in older cohorts. Despite its minimal impact on the role of sociodemographic factors (Degenhardt et al., in press; Degenhardt et al., 2007), an additional limitation is that drug dependence was assessed only among respondents with a history of drug abuse. The principal strengths of the study, in comparison, include its use of a nationally-representative sample and assessment of multiple stages of the drug use trajectory. The findings therefore provide novel descriptive information for selective prevention programs and for advancing hypothesis-driven research concerning underlying mechanisms of risk.

CONCLUSION

Commonly-cited sociodemographic risk factors may have markedly different associations depending on stage of the drug use trajectory. The present findings underscore the extent to which knowledge of transitions *between* stages is necessary for etiologic models and may be a critical determinant of the precision at which existing prevention programs apply findings from epidemiologic research.

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References

- Anthony JC, Petronis KR. Early-onset drug use and risk of later drug problems. *Drug Alcohol Depend* 1995;40:9–15. [PubMed: 8746919]
- Anthony JC, Warner LA, Kessler RC. Comparative epidemiology of dependence on tobacco, alcohol, controlled substances and inhalants: Basic findings from the National Comorbidity Survey. *Exp Clin Psychopharmacol* 1994;2:244–268.
- Chamberlain CD, Mutaner C, Walrath C. Gender, occupational, and socioeconomic correlates of alcohol and drug abuse among U.S. rural, metropolitan, and urban residents. *Am J Drug Alcohol Abuse* 2004;30:409–428. [PubMed: 15230083]
- Chen CY, O’Brien MS, Anthony JC. Who becomes cannabis dependent soon after onset of use? Epidemiological evidence from the United States: 2000–2001. *Drug Alcohol Depend* 2005;79:11–22. [PubMed: 15943940]
- Compton WM, Thomas YF, Stinson FS, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV Drug Abuse and Dependence in the United States. *Arch Gen Psychiatry* 2007;64:566–576. [PubMed: 17485608]
- Cuijpers P. Three decades of drug prevention research. *Drugs: Educ Prev Policy* 2003;10:7–20.

- Degenhardt, Bohnert, Anthony. Assessment of cocaine and other drug dependence in the general population: “gated versus “ungated” approaches. *Drug Alcohol Depend* 2008;93:227–32. [PubMed: 18065161]
- Degenhardt L, Cheng H, Anthony J. Assessing cannabis dependence in community surveys: Methodological issues. *Int J Methods Psychiatr Res* 2007;16:43–51. [PubMed: 17623384]
- Degenhardt L, Lynskey M, Hall W. Cohort trends in the age of initiation of drug use in Australia. *Aust N Z J Public Health* 2000;24:421–426. [PubMed: 11011471]
- Efron B. Logistic regression, survival analysis, and the Kaplan-Meier curve. *J Am Stat Assoc* 1988;83:414–425.
- Farrell M, Howes S, Bebbington P, Brugha T, Jenkins R, Lewis G, Marsden J, Taylor C, Meltzer H. Nicotine, alcohol and drug dependence and psychiatric comorbidity. *Br J Psychiatry* 2001;179:432–437. [PubMed: 11689401]
- Gallop RJ, Crits-Christoph P, Ten Have TR, Barber JP, Frank A, Griffin ML, Thase ME. Differential transitions between cocaine use and abstinence for men and women. *J Consult Clin Psychol* 2007;75:95–103. [PubMed: 17295568]
- Grant BF, Dawson DA. Age of onset of drug use and its association with DSM-IV drug abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. *J Subst Abuse* 1998;10:163–173. [PubMed: 9854701]
- Haro JM, Arbabzadeh-Bouchez S, Brugha TS, de Girolamo G, Guyer ME, Jin R, et al. Concordance of the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health surveys. *Int J Methods Psychiatr Res* 2006;15:167–180. [PubMed: 17266013]
- Hawkins D, Catalano R, Miller J. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychol Bull* 1992;112:64–105. [PubMed: 1529040]
- Johnson EO, Schultz L. Forward telescoping bias in reported age of onset: an example from cigarette smoking. *Int J Methods Psychiatr Res* 2005;14 (3):119–129. [PubMed: 16389888]
- Johnson RA, Gerstein DR. Initiation of use of alcohol, cigarettes, marijuana, cocaine, and other substances in US birth cohorts since 1919. *A J Public Health* 1998;88:27–33.
- Kerr WC, Greenfield TK, Bond J, Ye Y, Rehm J. Age-period-cohort influences on trends in past year marijuana use in the U.S. from the 1984, 1990, 1995 and 2000 National Alcohol Surveys. *Drug Alcohol Depend* 2007;86:132–138. [PubMed: 16806739]
- Kessler RC, Berglund P, Chiu WT, Demler O, Heeringa S, Hiripi E, et al. The US National Comorbidity Survey Replication (NCS-R): design and field procedures. *Int J Methods Psychiatr Res* 2004;13:69–92. [PubMed: 15297905]
- Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005;62:593–602. [PubMed: 15939837]
- Kessler RC, Merikangas KR. The National Comorbidity Survey Replication (NCS-R): background and aims. *Int J Methods Psychiatr Res* 2004;13:60–68. [PubMed: 15297904]
- Kessler RC, Ustun TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res* 2004;13:93–121. [PubMed: 15297906]
- Konings E, Dubois-Arber F, Narring F, Michaud PA. Identifying adolescent drug users: results of a national survey on adolescent health in Switzerland. *J Adolesc Health* 1995;16:240–247. [PubMed: 7779836]
- Kraemer H, Kazdin A, Offord D, Kessler RC, Jensen P, Kupfer D. Coming to terms with the terms of risk. *Arch Gen Psychiatry* 1997;54:337–43. [PubMed: 9107150]
- Lynskey M, White V, Hill D, Letcher T, Hall W. Prevalence of illicit drug use among youth: results from the Australian School Students’ Alcohol and Drugs Survey. *Aust N Z J Public Health* 1999;23:519–524. [PubMed: 10575775]
- McCabe SE, West BT, Morales M, Cranford JA, Boyd CJ. Does early onset of non-medical use of prescription drugs predict subsequent prescription drug abuse and dependence? Results from a national study. *Addiction*. 2007 Epub ahead of print.

- Medina-Mora ME, Borges G, Lara C, Benjet C, Blanco J, Fleiz C, Villatoro J, Rojas E, Zambrano J. Prevalence, service use, and demographic correlates of 12-month DSM-IV psychiatric disorders in Mexico: results from the Mexican National Comorbidity Survey. *Psychol Med* 2005;35:1773–1783. [PubMed: 16300691]
- Melchior M, Chastang JF, Goldberg P, Fombonne E. High prevalence rates of tobacco, alcohol and drug use in adolescents and young adults in France: Results from the GAZEL Youth study. *Addict Behav.* 2007 Epub ahead of print.
- Oakley Browne MA, Wells JE, Scott KM, McGee MA. New Zealand Mental Health Survey Research Team, 2006. Lifetime prevalence and projected lifetime risk of DSM-IV disorders in Te Rau Hinengaro: the New Zealand Mental Health Survey. *Aust N Z J Psychiatry* 40:865–874. [PubMed: 16959012]
- O'Brien MS, Anthony JC. Risk of becoming cocaine dependent: Epidemiological estimates for the United States, 2000–2001. *Neuropsychopharmacology* 2005;30:1006–1018. [PubMed: 15785780]
- Perkonig A, Pfister H, Höfler M, Frohlich C, Zimmermann P, Lieb R, Wittchen HU. Substance use and substance use disorders in a community sample of adolescents and young adults: incidence, age effects and patterns of use. *Addict Res* 2006;12:187–196.
- Research Triangle Institute. SUDAAN: Professional Software for Survey Data Analysis, 9.0. Research Triangle Park, NC: Research Triangle Institute; 2004.
- Stone AL, O'Brien MS, De La Torre A, Anthony JC. Who is becoming hallucinogen dependent soon after hallucinogen use starts? *Drug Alcohol Depend* 2007;87:153–163. [PubMed: 16987612]
- Toumbourou JW, Stockwell T, Neighbors C, Marlatt GA, Sturge J, Rehm J. Interventions to reduce harm associated with adolescent substance use. *Lancet* 2007;369:1391–1401. [PubMed: 17448826]
- Van Etten ML, Neumark YD, Anthony JC. Male-female differences in the earliest stages of drug involvement. *Addiction* 1999;94:1413–1419. [PubMed: 10615725]
- von Sydow K, Lieb R, Pfister H, Höfler M, Wittchen HU. Use, abuse and dependence of ecstasy and related drugs in adolescents and young adults—a transient phenomenon? Results from a longitudinal community study. *Drug Alcohol Depend* 2002;66:147–159. [PubMed: 11906802]
- Wagner FA, Anthony JC. Male-female differences in the risk of progression from first use to dependence upon cannabis, cocaine, and alcohol. *Drug Alcohol Depend* 2007;86:191–198. [PubMed: 17029825]
- Wallace JM, Bachman JG, O'Malley PM, Schulenberg JE, Cooper SM, Johnston LD. Gender and ethnic differences in smoking, drinking and illicit drug use among American 8th, 10th, and 12th grade students 1976–2000. *Addiction* 2003;98:225–234. [PubMed: 12534428]
- Warner LA, Kessler RC, Hughes M. Prevalence and correlates of drug use and dependence in the United States: Results from the National Comorbidity Survey. *Arch Gen Psychiatry* 1995;52:219–229. [PubMed: 7872850]
- Winters KC, Fawkes T, Fahnhorst T, Botzet A, August G. A synthesis of exemplary drug abuse prevention programs in the United States. *J Subst Abuse Treat* 2007;32:371–380. [PubMed: 17481460]
- Wolter, KM. Introduction to Variance Estimation. New York: Springer-Verlag; 1985.

Figure 1.

Age of onset of drug use stages. U.S. National Comorbidity Survey Replication (NCS-R) data collected between February 2001 and April 2003

Figure 2.
Speed of transition between drug use stages. U.S. National Comorbidity Survey Replication (NCS-R) data collected between February 2001 and April 2003

Table 1

Lifetime prevalence of classes of drug use, disorders and remission for Part II sample (n=5692). U.S. National Comorbidity Survey Replication (NCS-R) data collected between February 2001 and April 2003

	N	Birth Cohort								Total	
		1972-1983		1957-1971		1942-1956		1941 or before		n	% (SE)
		n	% (SE)	n	% (SE)	n	% (SE)	n	% (SE)		
Unconditional											
Opportunity to use drugs	4428	1371	88.5 (1.1)	1826	87.9 (1.2)	1521	76.5 (1.3)	974	28.5 (1.6)	5692	72.4 (0.8)
Use of any illicit drug	2940	1371	54.2 (1.9)	1826	60.6 (1.9)	1521	47.1 (1.9)	974	7.4 (1.0)	5692	44.2 (1.1)
Abuse of any illicit drug	651	1371	11.1 (0.9)	1826	12.1 (1.0)	1521	6.8 (0.7)	974	0.3 (0.1)	5692	8.0 (0.4)
Dependence on any illicit drug	248	1371	3.9 (0.5)	1826	5.1 (0.7)	1521	2.3 (0.4)	974	0.2 (0.1)	5692	3.1 (0.2)
Remission from drug abuse	344	1371	4.7 (0.5)	1826	6.3 (0.6)	1521	4.3 (0.5)	974	0.1 (0.1)	5692	4.1 (0.3)
Remission from drug dependence	212	1371	2.9 (0.4)	1826	4.9 (0.6)	1521	2.2 (0.4)	974	0.2 (0.1)	5692	2.6 (0.2)
Conditional											
Use given opportunity	2940	1232	61.2 (1.8)	1670	68.8 (1.8)	1220	61.5 (2.3)	306	25.8 (3.2)	4428	61.0 (1.3)
Abuse given use	651	824	20.5 (1.6)	1218	20.0 (1.6)	806	14.5 (1.4)	92	3.9 (2.0)	2940	18.0 (0.9)
Dependence given abuse	248	208	35.2 (3.6)	291	42.6 (3.5)	146	33.9 (3.7)	6	65.4 (21.0)	651	38.4 (2.2)
Remission given abuse	344	134	65.9 (4.4)	166	91.4 (2.2)	100	95.7 (2.4)	3	100.0 (0.0)	403	83.7 (1.9)
Remission given dependence	212	74	73.4 (5.3)	125	90.9 (3.4)	46	94.1 (3.0)	3	100.0 (0.0)	248	86.4 (2.8)

Table 2

Sociodemographic predictors of first drug use opportunity and transitions to use, abuse and dependence. U.S. National Comorbidity Survey Replication (NCS-R) data collected between February 2001 and April 2003

Predictors	Category	1st opportunity to use in Part II of sample		1st drug use among those having opportunity		Drug abuse among drug users		Drug dependence among drug abusers	
		OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Person year	INT [†]	1.07*	1.06 – 1.07	0.76*	0.73 – 0.79	0.89*	0.87 – 0.91	0.78*	0.70 – 0.87
	X ² ₁ [p]	213.2	[.000]	250.3	[.000]	131.0	[.000]	20.4	[.000]
Birth Cohort	1972–1983	27.46*	20.74 – 36.35	3.00*	2.15 – 4.18	2.48	0.79 – 7.83	0.41	0.11 – 1.49
	1957–1971	24.11*	18.21 – 31.92	3.26*	2.35 – 4.53	1.94	0.65 – 5.81	0.43	0.13 – 1.45
	1942–1956	12.36*	9.32 – 16.38	2.95*	2.06 – 4.24	1.81	0.59 – 5.57	0.38	0.12 – 1.18
	1941 or before	1	---	1	---	1	---	1	---
Sex	X ² ₃ [p]	714.0	[.000]	56.4	[.000]	4.5	[.214]	3.3	[.350]
	Female	0.68*	0.62 – 0.74	0.81*	0.69 – 0.95	0.62*	0.52 – 0.73	1.51*	1.11 – 2.07
	Male	1	---	1	---	1	---	1	---
	X ² ₁ [p]	76.9	[.000]	7.4	[.007]	32.6	[.000]	7.2	[.007]
Race-ethnicity	Hispanic	0.86	0.74 – 1.00	0.81*	0.66 – 1.00	0.91	0.62 – 1.34	0.78	0.35 – 1.73
	Black	0.98	0.87 – 1.10	0.73*	0.60 – 0.89	0.96	0.71 – 1.30	1.31	0.81 – 2.10
	Other	0.62*	0.48 – 0.79	0.98	0.68 – 1.40	2.09*	1.32 – 3.31	1.84	0.94 – 3.61
	White	1	---	1	---	1	---	1	---
	X ² ₃ [p]	17.4	[.001]	13.3	[.004]	13.3	[.004]	5.1	[.163]
	Student	3.01*	2.16 – 4.20	1.54*	1.16 – 2.06	2.03*	1.24 – 3.35	1.21	0.56 – 2.61
Education	Low	3.14*	1.95 – 5.06	1.31	0.93 – 1.84	2.79*	1.69 – 4.63	1.52	0.70 – 3.31
	Low/Med	3.06*	1.98 – 4.74	1.14	0.86 – 1.52	1.91*	1.11 – 3.30	0.99	0.51 – 1.90
	Medium	3.31*	2.25 – 4.89	0.92	0.69 – 1.22	2.06*	1.12 – 3.79	0.82	0.41 – 1.63
	High	1	---	1	---	1	---	1	---
Marital status	X ² ₄ [p]	54.3	[.000]	18.6	[.001]	20.2	[.000]	7.4	[.117]
	Never	7.46*	5.42 – 10.25	1.51*	1.28 – 1.80	1.89*	1.38 – 2.58	1.51	0.80 – 2.83

Predictors	Category	1st opportunity to use in Part II of sample		1st drug use among those having opportunity		Drug abuse among drug users		Drug dependence among drug abusers	
		OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Additional Predictors	Formerly	1.02	0.74 – 1.41	2.64*	1.92 – 3.63	2.26*	1.36 – 3.77	1.83	0.83 – 4.01
	Currently	1	---	1	---	1	---	1	---
	X ² ₂ [p]	167.4	[.000]	46.0	[.000]	24.2	[.000]	2.5	[.291]
	Age of 1st opportunity	---	---	1.00	0.98 – 1.01	---	---	---	---
	X ² ₁ [p]	---	---	0.4	[.532]	---	---	---	---
	Age of 1 st drug used	---	---	---	---	0.94*	0.92 – 0.97	---	---
	X ² ₁ [p]	---	---	---	---	23.6	[.000]	---	---
	Time: opp. to use	---	---	---	---	0.92*	0.87 – 0.98	---	---
	X ² ₁ [p]	---	---	---	---	8.4	[.004]	---	---
	Age of drug abuse	---	---	---	---	---	---	1.00	0.93 – 1.07
	X ² ₁ [p]	---	---	---	---	---	---	.01	[.903]
	Time: opp. to abuse	---	---	---	---	---	---	0.99	0.88 – 1.12
	X ² ₁ [p]	---	---	---	---	---	---	.04	[.843]
	Time: use to abuse	---	---	---	---	---	---	1.05	0.94 – 1.17
	X ² ₁ [p]	---	---	---	---	---	---	.8	[.384]
	Number drugs used: 1	---	---	---	---	1	---	1	---
	Number drugs >=2	---	---	---	---	0.87	0.49 – 1.55	1.39	0.61 – 3.16
	X ² ₁ [p]	---	---	---	---	0.2	[.628]	0.6	[.421]
	Drug: Cannabis	---	---	---	---	1	---	1	---
	Drug: Cocaine	---	---	---	---	5.88*	4.08 – 8.49	2.20*	1.17 – 4.15
	Drug: Extra-medical	---	---	---	---	3.61*	2.38 – 5.48	1.16	0.69 – 1.96
	Drug: other	---	---	---	---	5.37*	3.73 – 7.74	1.97*	1.12 – 3.47
	X ² ₃ [p]	---	---	---	---	140.4	[.000]	13.3	[.004]

† person-year indicator (INT) is based on chronological age for first opportunity to use drugs, and years since last stage for drug use, abuse and dependence.

* OR significant at .05 level, two-tailed test

Table 3

Sociodemographic predictors of remission from drug abuse and dependence. U.S. National Comorbidity Survey Replication (NCS-R) data collected between February 2001 and April 2003

Predictors	Category	Remission from Drug Abuse w/o Dependence		Remission from Drug Dependence	
		OR	(95% CI)	OR	(95% CI)
Person year	INT [†]	1.03*	1.01 – 1.06	1.11*	1.08 – 1.15
	X ² ₁ [p]	8.1	[.005]	47.3	[.000]
Birth Cohort	1972–1983	7.41*	4.33 – 12.68	13.31*	3.77 – 46.95
	1957–1971	3.01*	2.15 – 4.22	3.77*	1.36 – 10.40
	1942–1956	1.93*	1.43 – 2.59	1.32	0.52 – 3.36
	1941 or before	1	---	1	---
Sex	X ² ₃ [p]	57.8	[.000]	48.0	[.000]
	Female	1.53*	1.10 – 2.11	1.58*	1.14 – 2.20
	Male	1	---	1	---
	X ² ₁ [p]	6.9	[.009]	8.0	[.005]
	Hispanic	0.84	0.54 – 1.31	0.66	0.27 – 1.65
Race-ethnicity	Black	0.64	0.40 – 1.02	0.67	0.40 – 1.12
	Other	1.24	0.72 – 2.13	1.43	0.80 – 2.55
	White	1	---	1	---
	X ² ₃ [p]	5.9	[.116]	4.1	[.249]
	Student	0.66	0.38 – 1.15	0.48*	0.23 – 0.99
Education	Low	0.83	0.50 – 1.39	0.74	0.38 – 1.43
	Low/Med	0.86	0.53 – 1.38	0.90	0.50 – 1.61
	Medium	1.28	0.79 – 2.09	0.89	0.51 – 1.54
	High	1	---	1	---
	X ² ₄ [p]	9.8	[.045]	5.2	[.269]
Marital status	Never	1	0.73 – 1.36	1.38	0.87 – 2.19
	Formerly	1.28	0.86 – 1.91	1.17	0.72 – 1.89
	Currently	1	---	1	---

Predictors	Category	Remission from Drug Abuse w/o Dependence		Remission from Drug Dependence	
		OR	(95% CI)	OR	(95% CI)
Additional Predictors	X^2_2 [p]	1.7	[.434]	2.0	[.367]
	Age of drug abuse	1.08*	1.04 – 1.13	---	---
	X^2_1 [p]	6.3	[.012]	---	---
	Time: drug use to abuse	0.99	0.95 – 1.03	---	---
	X^2_1 [p]	0.2	[.624]	---	---
	Age of drug dependence	---	---	0.97	0.93 – 1.01
	X^2_1 [p]	---	---	2.1	[.153]
	Time: drug abuse to dependence	---	---	0.99	0.94 – 1.04
	X^2_1 [p]	---	---	0.3	[.581]
	Number drugs used: 1	1	---	---	---
	Number drugs ≥ 2	2.10	0.39 – 11.22	---	---
	X^2_1 [p]	0.8	[.371]	---	---
	Drug: Cannabis	1	---	1	---
	Drug: Cocaine	0.14*	0.04 – 0.45	0.33	0.07 – 1.54
	Drug: Extra-medical	0.13*	0.04 – 0.50	0.33	0.07 – 1.65
	Drug: other	0.24*	0.07 – 0.84		
	X^2_3 [p] X^2_2 [p]	15.4	[.002]	6.1	[.047]

[†] person-year indicator (INT) is based on chronological age for first opportunity to use drugs, and years since last drug use stage

* OR significant at .05 level, two-tailed test